(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Publication number : **0 573 187 A1**

cc: T. Huynh
J. Schaan

(12) **EUROPEAN PATENT APPLICATION**

(21) Application number : **93303971.1**

(51) Int. Cl.[5] : **B41J 3/407**

(22) Date of filing : **21.05.93**

(30) Priority : **01.06.92 GB 9211544**
24.07.92 GB 9215782
11.06.92 GB 9212423
15.01.93 GB 9300750

(43) Date of publication of application :
08.12.93 Bulletin 93/49

(84) Designated Contracting States :
DE FR GB IT

(71) Applicant : **ESSELTE DYMO N.V.**
Industriepark-Noord 30, P.O. Box 85
B-2700 St. Niklaas (BE)

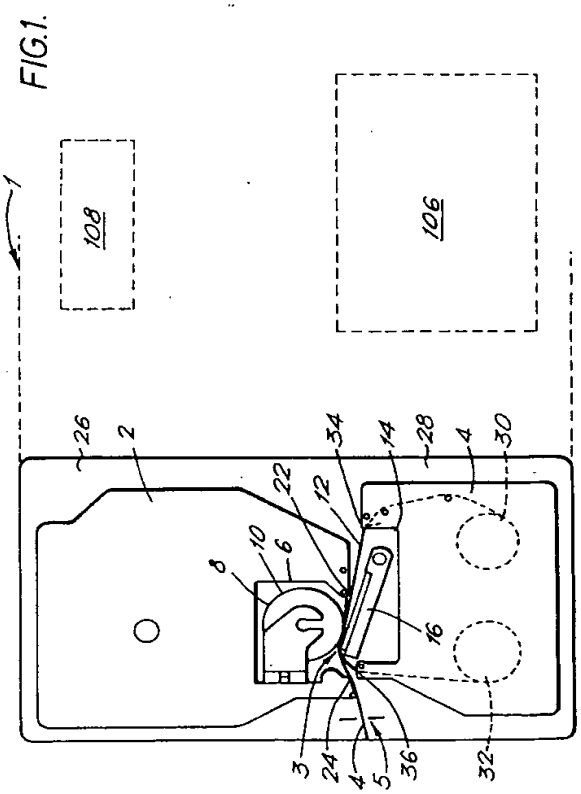
(72) Inventor : **Sims, Charles Robert**
70 Chapel Lane, Fowlmere
Royston, Hertfordshire SG8 7SD (GB)
Inventor : **Halket, Andrew Richard Buchanan**
41 York Street
Cambridge CB1 2PZ, Cambridgeshire (GB)
Inventor : **Beadman, Michael Andrew**
2 Cheyney Street, Steeple Morden
Royston, Hertfordshire SG8 0LP (GB)

(74) Representative : **Driver, Virginia Rozanne et al**
Page White & Farrer 54 Doughty Street
London WC1N 2LS (GB)

(54) **Thermal printing device.**

(57) A thermal printing device has first and second tape holding cases (2,4) located in respective cassette receiving portions. The first and second tape holding cases are individually removable and replaceable so that different combinations of background colour and print colour can be selected. There is no need for one tape holding case to guide the other nor for them to be clipped together.

FIG.1.



EP 0 573 187 A1

This invention relates to a thermal printing device.

Thermal printing devices of the general type with which the present invention is concerned are known. They operate with a supply of tape arranged to receive an image and means for transferring an image onto the tape. In one known device, a tape holding case holds a supply of image receiving tape and a supply of an image transfer ribbon, the image receiving tape and the transfer ribbon being passed in overlap through a printing zone of the printing device. At the print zone, a thermal print head cooperates with a platen to transfer an image from the transfer ribbon to the tape. A printing device operating with a tape holding case of this type is described for example in EP-A-0267890 (Varitronics, Inc.). Other printing devices have been made in which letters are transferred to an image receiving tape by a dry lettering or dry film impression process. In all of these printing devices, the construction of the image receiving tape is substantially the same. That is, it comprises an upper layer for receiving an image which is secured to a releaseable backing layer by a layer of adhesive.

Once an image or message has been printed on the tape, that portion of the tape is cut off to enable it to be used as a label. The releaseable backing layer is removed from the upper layer to enable the upper layer to be secured to a surface by means of the adhesive layer.

In another known printing device, described in EP-A-0322918 (Brother Kogyo K.K.), a tape holding case houses a supply of a transparent image receiving tape and a supply of an image transfer ribbon. The tape holding case also houses a supply of backing tape which comprises a carrier layer having an adhesive layer on its underside to which is secured a releaseable backing sheet and an adhesive layer on its upper side which can be secured to the image receiving tape after an image has been printed thereon. In this device, the image is printed onto the image receiving tape as a mirror image which, when viewed through the image receiving tape, is the correct way round. With this device, the print is protected when the label is used.

In all of these devices, the colour of the label and the colour of the print are predetermined by the contents of the tape holding case. By the colour of the label reference is made to the upper layer of the image receiving tape of the apparatus described in EP-A-0267890 and to the carrier layer of the device described with reference to EP-0322918. The colour of the print is determined by the colour of the image transfer ribbon. Thus labels of one particular colour can only be printed with ink of a particular colour. Moreover, because the image receiving tape and image transfer tape are in the same tape holding case, they will run out together.

In another device disclosed in GB 2161754, two separate cassettes are provided which clip together to form a single unit which can then be inserted in a machine, the cassettes supplying ink ribbon and substrate tape from a side location towards a print station. In order to replace one cassette with another it is necessary to unclip the cassettes, replace the required cassette and reclip the new cassettes together before inserting them in a device. This makes the system awkward to use.

In another device, there are two cassettes with an ink ribbon cassette being located within a substrate tape cassette in a nested fashion, on a common side of the print zone. This means that it is fiddly and awkward to remove the ink ribbon cassette to change it. Also, the external dimensions of the ink ribbon cassette are determined by the dimensions of the substrate tape so that its size or capacity could only be increased at the expense of the substrate tape.

According to the present invention there is provided a thermal printing device having a first cassette receiving portion for receiving a first tape holding case housing a supply of an image transfer ribbon capable of printing an image of a particular colour; a second cassette receiving portion for receiving a second tape holding case housing a supply of image receiving tape having a particular background colour; means for moving the image receiving tape through a printing zone in overlap with said image transfer ribbon so that an image can be transferred from the image transfer ribbon onto the image receiving tape, the first and second cassette receiving portions being on opposed sides of said printing zone; wherein the first and second tape holding cases are individually removable and replaceable whereby different combinations of background colour and print colour can be selected.

This arrangement has the advantage not only that print and background colours can be "mixed and matched" but that the first tape holding case can accommodate significantly more image transfer ribbon than the second tape holding case can accommodate image receiving tape.

This means that the "ink ribbon cassette" can be made more cheaply since the proportional cost of ink ribbon is less that the cost of an extra tape holding case. A user also has less need to change the ink ribbon cassette as frequently. Furthermore, the ink ribbon is less likely to run out during printing of a label so that there is less wastage of substrate tape due to printing of defective labels. In the preferred embodiment, the first tape holding case has five times more ink ribbon than the second tape holding case has image receiving tape.

As the printing device has two separate receiving portions for the first and second tape holding cases, each case can be easily removed and located separately without affecting the other. As each tape holding case is received separately, one is not required to

guide the other so they can be removed, mixed and matched as desired. Further, the size and capacity of each cassette is determined only by the cassette receiving portions and not by each other.

For a better understanding of the present invention, and to show how the same may be carried into effect, reference will now be made by way of example to the accompanying drawings in which:

Figure 1 is a plan view showing two cassettes inserted in a printing device;

Figure 2 is a diagrammatic sketch showing the control circuitry for the printing device; and

Figure 3 is a diagram showing a label which can be produced using the printing device.

Figure 1 shows in plan view two cassettes arranged in a printing device 1. The upper cassette 2 is located in a first cassette receiving portion 26 and contains a supply of image receiving tape 4 which passes through a print zone 3 of the printer to an outlet 5 of the printer. The image receiving tape 4 comprises an upper layer for receiving a printed image on one of its surfaces and having its other surface coated with an adhesive layer to which is secured a releaseable backing layer. The cassette 2 has a recess 6 for accommodating a platen 8 of the printer, and guide portions 22,24 for guiding the tape 4 through the print zone. The platen 8 is mounted for rotation within a cage moulding 10. As an alternative, the platen 8 could be mounted for rotation on a pin.

The lower cassette 4 is located in a second cassette receiving portion 28 and contains a thermal transfer ribbon which extends from a supply spool 30 to a take-up spool 32 within the cassette 4. The thermal transfer ribbon 12 extends through the print zone 3 in overlap with the image receiving tape 4. The cassette 4 has a recess 14 for receiving a print head 16 of the printer and guide portions 34,36 for guiding the ink ribbon 12 through the print zone 3. The print head 16 is movable between an operative position, shown in Figure 1, in which it is in contact with the platen and holds the thermal transfer ribbon 12 and the image receiving tape in overlap between the print head and the platen and an inoperative position in which it is moved away from the platen to release the thermal transfer ribbon and image receiving tape. In the operative position, the platen is rotated to cause image receiving tape to be driven past the print head and the print head is controlled to print an image onto the image receiving tape by thermal transfer of ink from the ribbon 12. The print head is a conventional thermal print head having an array of pixels each of which can be thermally activated in accordance with the desired image to be printed.

The printing device has a lid which is not shown but which is hinged along the rear of the cassette receiving portion and which covers both cassettes when in place.

A stepper motor drives the platen 8 in steps so that for each position of the platen a column of print is printed on the image receiving tape 4. The platen 8 drives the image receiving tape through the print zone under the action of its own rotation. The rotation of the platen and the energisation of the print head 16 are controlled by a microprocessor as described in our British Applications Nos. 9212423.9 and 9215782.5 the contents of which are herein incorporated by reference.

The basic circuitry for controlling the printing device is shown in Figure 2. There is a microprocessor chip 100 having read only memory (ROM) 102, a microprocessor 101 and random access memory capacity indicated diagrammatically by RAM 104. The microprocessor is connected to receive data input to it from a data input device such as a keyboard 106. The microprocessor chip 100 outputs data to drive a display 108 via a display driver chip 109 and also to drive the print head 16 and the stepper motor 7 for controlling the platen 8. The microprocessor chip also controls a cutting mechanism including a cutter 17 to cut off lengths of printed tape. The keyboard and display are located on the upper surface of the printing device to the right hand side of the cassette receiving portion as indicated by the dotted lines.

The operation of the printer will now be described. Data to be printed is typed into the printing device using data input keys on the keyboard 106. The data input keys are designated generally by the block 109 but will in practice comprise a plurality of lettered and numbered keys. As the data is entered into the keyboard 106 it is supplied to the microprocessor 101 which drives the display 108 to display the data as it is entered. To do this, for each character which is entered, the microprocessor calls up a stored version of the character from the ROM 102. As the character is stored in compressed form this font data is stored temporarily in the RAM 104 and is manipulated by the microprocessor 100 to generate pixel data to form the character. This pixel data is transmitted in one form to the display 108 and in another form to the print head for printing. Character data is not passed to the print head for printing until a print operation is executed. Firstly, the characters for the label are entered and edited using function keys on the keyboard 106 in conjunction with the display 108.

This ability for independent removal of the ink ribbon cassette 4 enables a user to change ink colour as desired. This enables multicolour labels to be produced in the following manner.

The label is composed by the user as a plurality of pages. Each page has unique characteristics in terms of its print style, size of font and number of lines to be printed. The pages will be printed side by side with a distance between them corresponding to normal character spacing. Pages can be of differing lengths. Where a page has been composed using the display and a next page is to be printed in a different

colour, a colour key 120 can be actuated which signals to the microprocessor that it should store end of page colour change data. Formulation of the label can then continue for the next page until there is to be another colour change when the colour key 120 is again depressed. Figure 3 shows a label composed of three pages; PAGE 1, PAGE 2 and PAGE 3. The dotted lines in between the pages are there for diagrammatic purposes only and will not appear on the finished label. As an example, PAGES 1 and 3 are to be printed in black and PAGE 2 is to be printed in red.

Once the final form of the label has been worked out, the microprocessor is aware of the pixel data for each page to be printed and has also calculated the overall length of the label. When a print operation is instigated using the print key 112 a column of pixel data is transmitted to the print head which prints this column of the image receiving tape. The stepper motor then moves the image receiving tape forward by one column width and the next column data is transferred to the print head and printed.

This sequence of operations is carried out until a page has been printed. Then, the end of page signal causes the microprocessor to display a symbol on the display 108 which indicates to a user that he should replace the present tape holding case 4 with a different tape holding case having a red ribbon. While this signal is being displayed, the motor driving the platen is stopped so that further movement of the image receiving tape past the print head is prevented. When the user has replaced the tape holding case printing can be resumed by pressing the print key 112, or by automatic detection of the "lid closed" position where closure of the lid automatically brings the print head to its print ready state. When the red page has been printed, the same sequence of operation occurs, the black tape cassette is reinserted and the third page is printed.

It will be apparent that the signal which indicates to a user that the tape holding case is to be replaced must be given when the printing operations for printing one page have ceased. That is, the part of the tape being printed at this time is not visible to a user so it would not be possible for a user to print multicolour labels in the absence of this signal.

In the described embodiment, the tape holding case is replaced manually by a user. In another embodiment, the printing device could have means for automatically manipulating tape holding cases so as to replace one by another on receipt of the appropriate signal.

When the complete label has been printed, the stepper motor moves the image receiving tape through a distance corresponding to the distance between the print head and a zone where cutting is implemented. A cutting operation is then executed by the cutter 7 to cut off the printed portion of the tape constituting the label.

It will be apparent that the length of each page can be determined by a user and in particular each page can have only a single character. However, where a label is to have multiple lines with different character sizes in each line it can be advantageous to inhibit operation of the colour change key in between characters to ensure that a situation does not arise where an attempt is made to change the colour midway through printing one character. This is done in the preferred embodiment by the microprocessor accepting a colour change instruction as a page break instruction, so that a new page is automatically commenced when a different colour is instructed.

Claims

1. A thermal printing device having a first cassette receiving portion for receiving a first tape holding case housing a supply of an image transfer ribbon capable of printing an image of a particular colour;

   a second cassette receiving portion for receiving a second tape holding case housing a supply of image receiving tape having a particular background colour;

   means for moving the image receiving tape through a printing zone in overlap with said image transfer ribbon so that an image can be transferred from the image transfer ribbon onto the image receiving tape, the first and second cassette receiving portions being on opposed sides of said printing zone;

   wherein the first and second tape holding cases are individually removable and replaceable whereby different combinations of background colour and print colour can be selected.

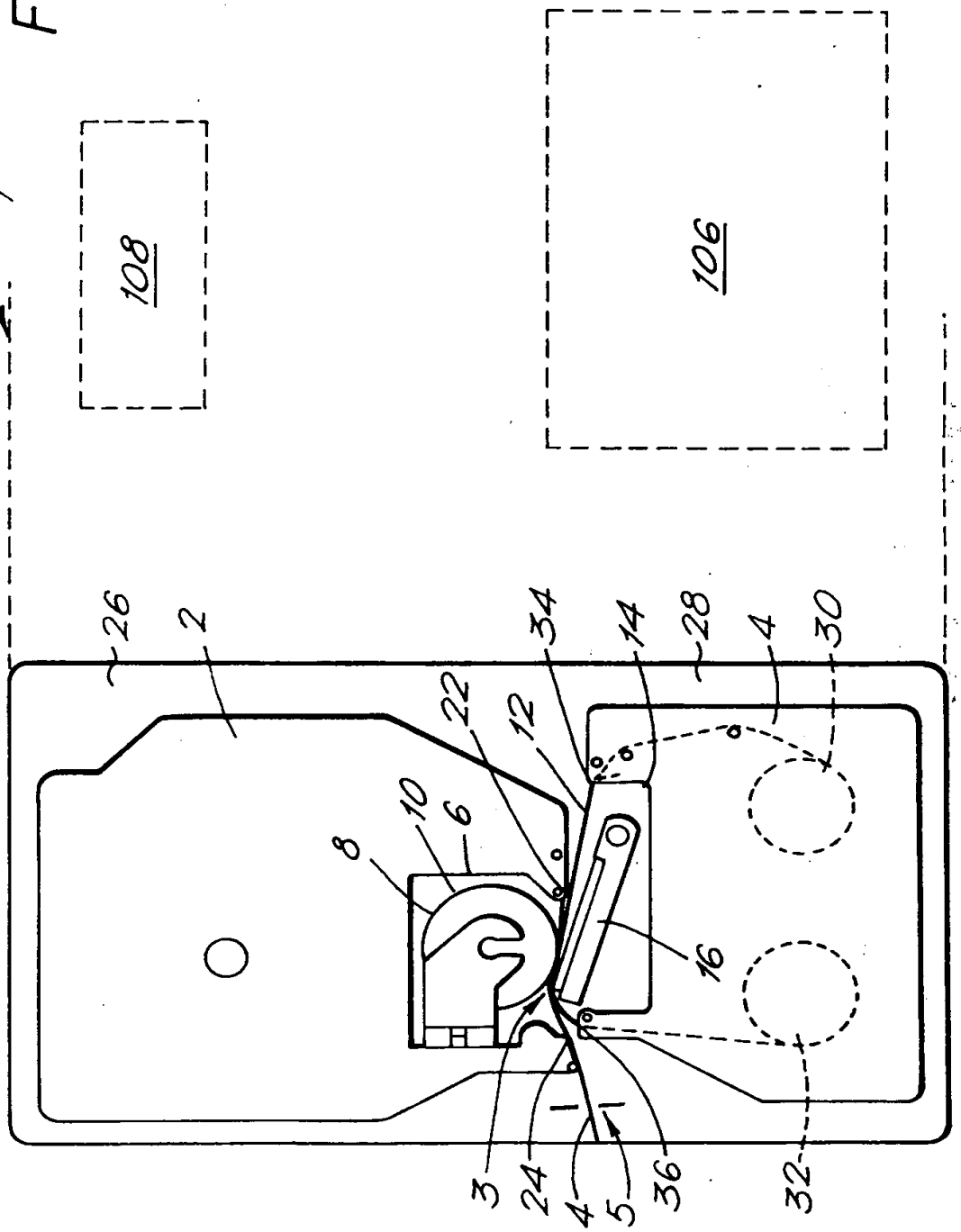
2. A thermal printing device as claimed in claim 1 wherein the first tape holding case contains more ink ribbon than the second tape holding case has image receiving tape.

3. A thermal printing device according to claim 2 wherein the first tape holding case has five times more ink ribbon than the second tape holding case.

4. A thermal printing device according to any preceding claim wherein printing means located at said printing zone comprises a print head and a platen with the image transfer ribbon and the image receiving tape arranged in overlap between the print head and the platen.

5. A thermal printing device according to claim 4 wherein the means for moving the image receiving tape through the printing zone comprises means for driving the platen to rotate.

FIG.1.



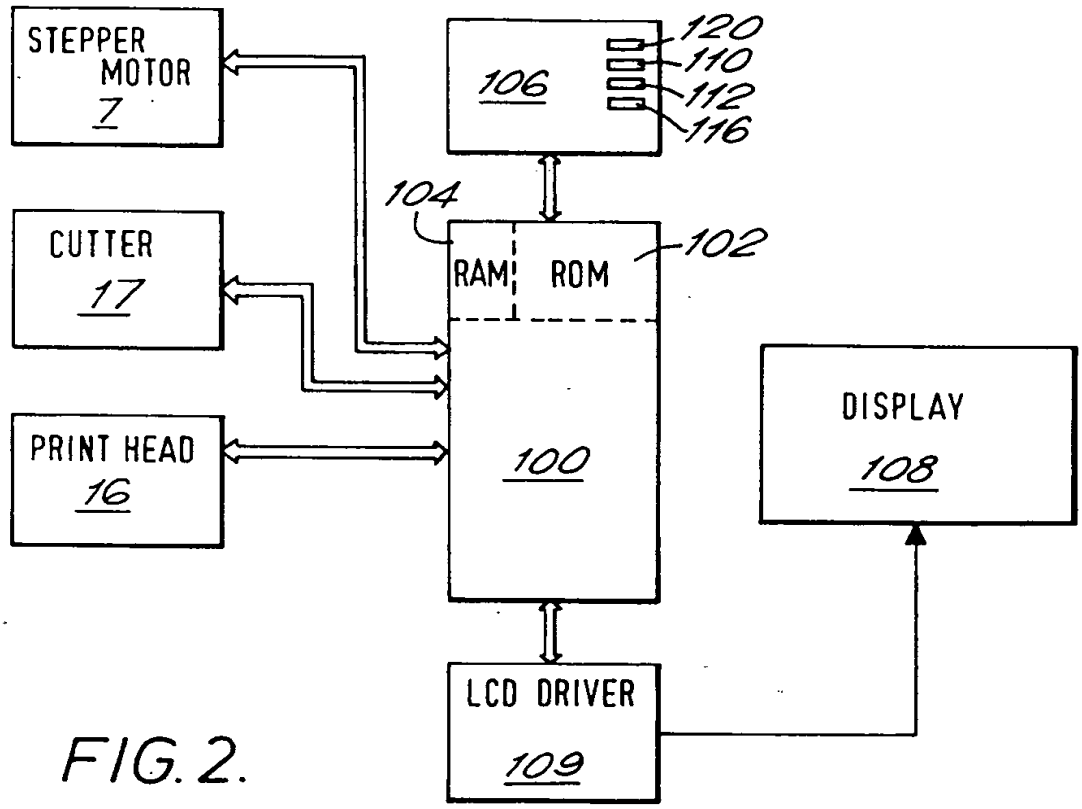

STEPPER MOTOR
7
CUTTER
17
PRINT HEAD
16
106
120
110
112
116
104
RAM
ROM
102
100
DISPLAY
108
LCD DRIVER
109

FIG. 2.

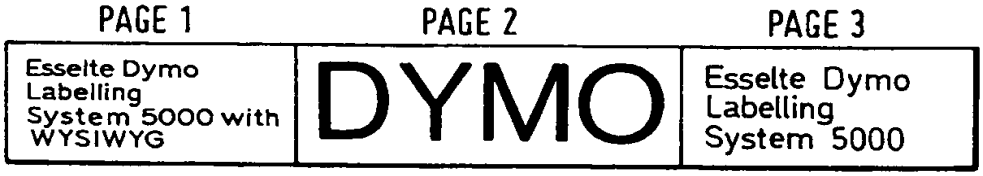

PAGE 1
PAGE 2
PAGE 3
Esselte Dymo Labelling System 5000 with WYSIWYG
DYMO
Esselte Dymo Labelling System 5000

FIG. 3.

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 93 30 3971

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
D,X	GB-A-2 161 754 (K-SUN CORPORATION (USA-MINNESOTA)) * the whole document *	1,2,4,5	B41J3/407
X	US-A-5 111 216 (RICHARDSON ET AL.) * claims 1-6 *	1,2,4	
A	EP-A-0 354 815 (ESSELTE METO INTERNATIONAL PRODUKTIONS GMBH) * claims 1-26 *	1-5	
X	US-A-5 028 934 (KASAI ET AL.) * column 4, line 58 - column 5, line 51 *	1,2,4	
			TECHNICAL FIELDS SEARCHED (Int. Cl.5)
			B41J B41K

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	17 AUGUST 1993	JOOSTING T.E.

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

EPO FORM 1503 03.82 (P0401)